

# **U.S. Energy – Efficient Technology Procurement Projects: Evaluation and Lessons Learned**

M.R. Ledbetter  
J.M. Norling  
S.D. Edgemon  
G.B. Parker  
J.W. Currie

PNNL-12118

February 1999

Prepared for the U.S. Department of Energy  
Under Contract DE-AC-06-76RLO 1830

LIMITED DISTRIBUTION NOTICE

This document copy, since it is transmitted in advance of patent clearance, is made available in confidence solely for use in performance of work under contracts with the U.S. Department of Energy. This document is not to be published nor its contents otherwise disseminated or used for purposes other than specified above before patent approval for such release or use has been secured, upon request, from Intellectual Property Services, Pacific Northwest National Laboratory, Richland, Washington 99352

**U.S. Energy – Efficient Technology  
Procurement Projects:  
Evaluation and Lessons  
Learned**

M.R. Ledbetter  
J.M. Norling  
S.D. Edgemon  
G.B. Parker  
J.W. Currie

February 1999

Prepared for  
the U.S. Department of Energy  
Under Contract DE-AC-06-76RLO 1830

Pacific Northwest National Laboratory  
Richland, Washington 99352

## Summary

This report evaluates three U.S. energy-efficient technology procurement projects for the primary purpose of gleaning key learned lessons, so that future practitioners of technology procurement might develop better programs, and avoid costly mistakes. Each of the projects are described in detail, and the results of each project are summarized and discussed.

The three projects evaluated are:

- 1) Super-Efficient Refrigerator Program – a project implemented by a consortium of electric utilities whose primary intent was to induce a refrigerator manufacturer to introduce to the market a new, highly efficient refrigerator that exceeded U.S. government minimum energy efficiency standards by at least 25%, yet cost no more than similar refrigerators with normal energy efficiency
- 2) U.S. Department of Energy's (DOE) High Efficiency Clothes Washer Volume Purchase – a project implemented by DOE and the City of Austin, Texas, whose primary intent was to build early, high volume sales for high-efficiency clothes washers that had just been introduced to the U.S. market
- 3) DOE's Sub-Compact Fluorescent Lamp (CFL) Technology Procurement – a project whose primary intent was to induce lamp manufacturers to introduce to the market new screw-base CFLs that are significantly smaller than the current generation of CFLs, which fail to fit in many common lighting fixtures

### Project Results

The Super-Efficient Refrigerator Program induced a manufacturer, Whirlpool, to manufacture a line of highly efficient refrigerators that exceeded minimum U.S. government energy efficiency standards by 30% to 41%. The new refrigerators helped demonstrate the feasibility of producing refrigerators that greatly exceeded the existing government energy efficiency standards (a key goal of the program), however, the refrigerators were eventually withdrawn from the market due to lower-than-expected sales. The cause for the lower-than-expected sales appears to have been insufficient and problematic marketing.

The High-Efficiency Clothes Washer Volume Purchase succeeded in securing an agreement with a supplier to provide clothes washers to the program at a price almost \$300 less than the prevailing retail price of such clothes washers. Use of the supply agreement was offered to local program partners, such as municipal water utilities, electric utilities, and public housing agencies. The first of such local partners, Austin, achieved strong sales through the project. Due, however, to the unexpectedly large amount of time required to arrange for other local partners, the project succeeded in arranging for only one other local partner, a U.S. Army base. The project was terminated

after one year with total sales well below the 10,000 washer goal, but achieved some mixed success.

The Sub-CFL Technology Procurement, which is still being implemented, succeeded in causing several manufacturers to introduce new, very small products to the market. Prices bid by suppliers in the demonstration phase (Phase I), ranged as low as 5.85 U.S. dollars, well below prevailing market retail prices for CFLs. Approximately 80,000 lamps were sold in Phase I, exceeding the Phase I sales goal of 15,000 lamps by more than a factor of six. Phase II, the full implementation phase, attracted even more aggressive bids than submitted in Phase I. Several of the lamps approved for Phase II are the same as those approved for Phase I, however, one new-to-the-market lamp was added, and evaluation of a new lamp from a new supplier is still underway. The sales goal for Phase II is one million lamps. Sales under Phase II were initiated in November of 1998; initial sales reports are not yet available.

## **Lessons Learned**

Evaluation of all three programs yielded sixteen lessons learned. Among the key lessons are:

- *The program development process should be **buyer** driven. In other words, the interests of buyers, their issues and concerns, market perspectives, and their willingness to buy should have heavy influence on the development and design of a program.*
- *Unless other circumstances strongly indicate otherwise, it is preferable to make more than one award in response to competitive solicitations.*
- *Although technology procurement projects have heavily relied upon guaranteed sales or exclusive access to large financial awards (SERP), DOE's clothes washer and sub-CFL programs have demonstrated that they are not always necessary to attract aggressive bids.*
- *Technology procurement programs that depend on sales to large volume buyers, particularly government agencies, should be designed to allow a long period of time (at least one to two years) for the target buyers to purchase product.*
- *Technology improvement brought forth through competitive procurements is not a one-step function ending with the market introduction of the new technology. Further technology improvements can be made during the implementation of the program, and this consideration should be designed into the program.*
- *Technology procurement programs can be a viable and effective alternative to technology introduction programs that rely on large subsidies.*
- *It is easy to underestimate the size and importance of the promotional/educational part of technology procurement programs.*

# Table of Contents

1.0 Introduction .....	1-1
2.0 Super-Efficient Refrigerator Program .....	2-1
2.1 Program Origin .....	2-1
2.2 Program Goals .....	2-1
2.3 Sponsors and Participants .....	2-2
2.4 Target Market .....	2-2
2.5 Program Design .....	2-2
2.6 Technical Specifications in the Request For Proposals .....	2-4
2.7 Bid Scoring Formula .....	2-5
2.8 Promoting the Winner's Products .....	2-5
2.9 Program Results .....	2-5
2.10 Contact Information .....	2-7
3.0 DOE's High-Efficiency Clothes Washer Volume Purchase .....	3-1
3.1 Program Origin .....	3-1
3.2 Program Goals .....	3-2
3.3 Sponsors/Participants .....	3-2
3.4 Target Market .....	3-2
3.5 Program Design .....	3-2
3.6 Technical Specifications in the Request For Proposals .....	3-4
3.7 Bid Scoring Formula .....	3-5
3.8 Promoting the Winner's Products .....	3-5
3.9 Program Results .....	3-5
3.10 Contact Information .....	3-8
4.0 DOE's Sub-CFL Technology Procurement Program .....	4-1
4.1 Program Origin .....	4-1
4.2 Program Goals .....	4-2
4.3 Sponsors/Participants .....	4-2
4.4 Target Market .....	4-3
4.5 Program Design .....	4-3
4.6 Technical Specifications in the Request For Proposals .....	4-4
4.7 Bid Scoring Formula .....	4-5
4.8 Promoting the Winner's Products .....	4-5
4.9 Program Results .....	4-5
4.10 Contact Information .....	4-8

5.0 Lessons Learned .....	5-1
5.1 Program Development Lessons .....	5-1
5.2 Program Design Lessons .....	5-3
5.3 Program Implementation Lessons .....	5-8
6.0 References .....	6-1

## 1.0 Introduction

This report is a review and evaluation of three U.S. technology procurement projects, with particular emphasis on the lessons learned from the development and implementation of those projects. It was prepared at the request of the International Energy Agency's (IEA) Annex III "Co-operative Procurement of Innovative Technologies for Demand-Side Management" within IEA's Demand-Side Management Implementing Agreement. Annex III separately engaged another contractor to evaluate several of its own pilot technology procurement projects. In arranging for this evaluation, IEA Annex III expressed interest in learning about U.S. experiences in technology procurement in the hope that they might find among those experiences useful lessons for future projects.

The three projects that are the focus of this report are the utility-sponsored Super-Efficient Refrigerator Program (SERP), the U.S. Department of Energy's (DOE) Clothes Washer Volume Purchase and DOE's Sub-CFL Technology Procurement Program (Phase I and II). SERP was implemented by a consortium of U.S. electric utilities and used a 30 million U.S. dollars (USD) prize pool to entice a manufacturer to produce and sell refrigerators that were 30% to 41% more efficient than required by U.S. government standards. DOE's Clothes Washer Volume Purchase was implemented by DOE in partnership with the City of Austin, Texas, to speed the market introduction of large-capacity high-efficiency clothes washers. DOE's Sub-Compact Fluorescent Lamp (CFL) Technology Procurement Program was designed to speed the improvement in CFL technology, with particular attention to reducing CFL size.

This evaluation is unconventional in that its lead author and two of the co-authors were principal participants in the design and implementation of the DOE programs reviewed here. As such, this is not an independent evaluation. The evaluation of these programs is very much an insiders' view. Despite the authors' best efforts to take an objective perspective on these programs, the reader should still keep in mind that the evaluation of the two DOE programs is largely a self-evaluation. The authors were involved in neither the design nor development of the Super-Efficient Refrigerator Program, although the lead author co-authored an earlier evaluation of that program.

The evaluation method used in this program is straightforward. Information was collected from key observers of and participants in these programs via both informal and formal interviews. In the case of the SERP evaluation, much of the information came from previous evaluations conducted by Pacific Northwest National Laboratory.

Pacific Northwest National Laboratory is operated by Battelle Memorial Institute, a private non-profit corporation, for DOE. The Laboratory is a DOE institution and has provided DOE with the primary technical support for developing and implementing the DOE technology procurement programs discussed in this report.

Preparation of this report was co-sponsored by IEA's Annex III and the U.S. Department of Energy (DOE).

## **2.0 The Super-Efficient Refrigerator Program**

In 1991, a group of U.S. electric utilities formed a consortium, the Super-Efficient Refrigerator Program, Inc. (SERP), whose mission was to advance the technology of refrigerators and bring energy-efficient and environmentally friendly refrigerators to consumers years before they would be available under normal market conditions. After securing commitments of participation from 24 electric utilities, SERP issued a Request for Proposals (RFP) to refrigerator manufacturers seeking their bids to design, manufacture and sell the most energy-efficient, chlorofluorocarbon (CFC)-free refrigerator possible in exchange for 30 million U.S. dollars (USD) of incentive money. The manufacturer that bid the most energy savings at the lowest cost per kilowatt-hour saved was to win the entire sum of the incentive money, provided that the manufacturer could sell enough qualifying models within the service areas of the participating utilities. In October of 1992, SERP received fourteen bids, from which it selected Whirlpool Corporation's bid. Whirlpool agreed to manufacture and sell, in the first phase of the program, a side-by-side, 22-cubic-foot refrigerator that consumed 30% less electricity than allowed by federal government energy standards. In the second phase, Whirlpool agreed to manufacture and sell two additional refrigerators (25 and 27 cubic feet [708 and 765 liters]) that beat federal standards by 41%.

### **2.1 Program Origin**

For years utilities had offered rebates and other forms of incentive programs to consumers to promote the purchase of energy-efficient refrigerator/freezers. While these programs were successful regionally, many utility planners believed they were not the most cost-effective way to expand the range of consumer choice in energy-efficient refrigerators. With the next round of federal refrigerator standards negotiations rapidly approaching, these entities believed the time was right to demonstrate that energy-efficient CFC-free refrigerators could be manufactured cost effectively. In 1991, the U.S. Environmental Protection Agency (EPA), the Natural Resources Defense Council (NRDC), the American Council for an Energy-Efficient Economy (ACEEE), the Washington State Energy Office and utilities such as Pacific Gas & Electric, Sacramento Municipal Utility District, Long Island Lighting Company and Southern California Edison began to discuss a nationwide market-based incentive program to accelerate the development of highly energy-efficient, automatic defrost, CFC-free refrigerator/freezers. These efforts eventually led to the formation of SERP.

### **2.2 Program Goals**

The primary goal of SERP was to entice a manufacturer to produce and sell an automatic defrost, CFC-free refrigerator that would be at least 25% more efficient than the 1993 federal standard, with a purchase price comparable to similar non-SERP units. This level



of efficiency was chosen because it was believed to be a reasonable balance between an aggressive efficiency improvement and a level cost effectively attainable with available technology. SERP believed that if one major manufacturer developed a significantly more efficient unit due to the program, competitors would follow suit in order to protect their market share, thus accelerating the introduction of energy-efficient refrigerator technology into the marketplace.

A second goal of the program was to demonstrate that this high level of efficiency could be achieved without the use of CFCs. With passage of the Clean Air Act Amendments of 1990, production of CFCs in the United States was required to cease as of January 1, 1996. There was a general consensus in the industry that the scarcity of CFCs would make efficiency improvements in refrigerators more difficult to achieve. SERP wanted a manufacturer to demonstrate that this was not necessarily the case.

SERP's third goal was to influence the 1998 scheduled revision of the federal government's energy-efficiency standard for refrigerators. There was widespread belief in the refrigerator industry that the refrigerator standards would not be made more stringent due to the CFC phase-out. Thus, persuading a manufacturer to produce a cost-effective, more efficient unit would demonstrate that achieving higher standards was technically and economically feasible.

### **2.3 Sponsors and Participants**

SERP members included electric utilities that serve 21% of U.S. households. These utilities provided the funds for the 30 million USD incentive pool, as well as financial and in-kind contributions to develop the program. The U.S. EPA also contributed significant managerial and analytical resources to assist SERP in developing the program. In addition, SERP worked closely with the Natural Resources Defense Council (NRDC), the American Council for an Energy-Efficient Economy (ACEEE), as well as several state and federal agencies, including EPA and DOE. The manufacturer that won the SERP award was Whirlpool Corporation.

### **2.4 Target Market**

SERP directly targeted residential consumers located within the service territories of SERP-member utilities. SERP indirectly targeted all refrigerator purchasers in the United States. Refrigerators account for approximately 14% of U.S. residential energy consumption.

### **2.5 Program Design**

The central feature of the SERP program design was the 30 million USD prize pool to be awarded to a single manufacturer that submitted the highest scoring bid. SERP believed

the so-called winner-take-all approach would allow competition in the marketplace to be used to the fullest extent. Some SERP members, however, expressed concern for linking the future success of the program to a single manufacturer.

SERP also specified that the allowable size range for the interior capacity of the winning refrigerator was between 14.5 and 26.7 cubic feet (411 and 756 liters). The draft RFP listed a capacity range of 14.5 to 24.4 cubic feet (411 to 691 liters); however, after considering comments received on the draft RFP, this size range was debated and modified several times before SERP settled on the 14.5 to 26.7 cubic feet range (411 to 756 liters). A major argument for allowing a broader size range was that manufacturers should be allowed the freedom to design a unit that meets their customers' size needs. Another argument in favor of the broad size range was that the technology in the winning refrigerator would eventually trickle over to all refrigerator sizes and models. SERP did not specify any style requirements.

The RFP required that the winning manufacturer identify the number of SERP refrigerator units to be produced over the life of the program. In other words, bidders were being asked to bid not only a refrigerator design, but also a sales commitment for those units. The more units bid, the higher the potential energy savings and the higher the potential bid score assigned by SERP. Each bidder had to show that it had a national distribution and service system and had produced 100,000 units or more in the 17.5-22.4 cubic feet (496 to 634 liters) size range per year for each of the last three calendar years prior to the bid. If the bidder did not meet this requirement, it would have to demonstrate its capability in this area by showing sufficient capital on hand, a national service network and signed contracts with a national distribution network. SERP wanted to ensure that the selected winner could mass produce units in a timely manner and distribute them widely and efficiently.

The RFP also required that deliveries to each member's service territory be made in proportion to the member's financial commitment to the incentive pool. The proposals were required to include a schedule and plan showing how delivery of the units into SERP members' service territories would be accomplished by the end of the delivery period, which was scheduled to run through June 30, 1997. The bid scoring formula gave favorable weighting to bids that showed the ability to quickly assemble and deliver the units, thus realizing energy-savings early in the program.

Many utilities were reluctant to participate in the program unless they were assured of receiving detailed information on where the SERP units were installed. Therefore, SERP included tracking criteria in the RFP. Proposals needed to state how tracking was to be performed and manufacturers were responsible for enumerating a minimum of 25% of sales, with the remainder being statistically estimated. The bidding manufacturers needed to provide detailed information to SERP on the tracking mechanism and anticipated tracking coverage.

SERP realized that there would be logistical challenges in tracking SERP refrigerator sales since utility service territories do not entirely coincide with refrigerator retailer

customer territories. Consequently, a unit purchased in one utility's service territory could be installed in another utility's service territory. This issue became known as the cross-border issue and SERP developed a policy to deal with this and other difficult situations.

From each utility's financial commitment, 4.27% was allocated to a cross-border account that could be used to pay incentives to the refrigerator manufacturer for refrigerator sales made in one utility's territory, yet installed in another's. If a SERP unit were sold in a SERP member's territory, yet installed in the territory of a non-SERP utility, SERP reimbursed the member that should have benefited from the "exported" unit with funds from the cross-border account, thus allowing that member to provide an incentive for an SERP unit to be sold later. Therefore, no utility ended up paying an incentive for a refrigerator without having that refrigerator installed in its territory. If the SERP unit was sold in one SERP utility's territory and was installed in the service territory of another SERP utility, then the utility in whose territory the unit was installed paid the incentive and no cross-border account funds were expended.

Another interesting situation arose when a SERP unit was installed in an area with a postal zip code where two utilities operate. If only one of these utilities was a SERP member, then it was assumed that the unit was being used by a SERP-member customer and the SERP member was not entitled to be reimbursed with funds from the cross-border account, unless the utility could prove otherwise. If both utilities in this situation were SERP members, each member paid a percentage of the incentive equal to the percentage of the customers in that area they served.

While the above information on sales tracking and the cross-border account may seem overly detailed, it is included to illustrate the complexity of designing a program in which a nationally-based sales program had to yield information on individual customer purchases and refrigerator installations. The system was doubly complex because this information determined the flows of large sums of money.

Finally, the SERP program design called for a large promotional program, to be implemented primarily by the winning bidder, with some assistance from SERP members.

## **2.6 Technical Specifications in the Request For Proposals**

To qualify for consideration by SERP, proposed refrigerators had to meet the following technical specifications:

- Maximum energy consumption: at least 25% lower than the maximum energy consumption allowed by the 1993 federal energy-efficiency standards for refrigerators
- Allowable size range: 14.5 to 26.7 cubic feet (411 to 756 liters) of interior volume
- CFC-free.

## **2.7 Bid Scoring Formula**

The bid scoring formula outlined in the RFP explained how a manufacturer's proposal would be judged. A total of 100 points was possible. Up to 75 points were available for the value of total energy savings that could be achieved by the proposed refrigerator, based on the efficiency of those units, how many the bidder proposed to sell and over what time period. The calculations for determining these energy savings assumed a value of 7 cents per kWh saved, an annual cost discount rate of 6% and a 19-year refrigerator life. Of the 25 remaining points, up to 20 could be awarded for corporate capability and reliability factors, up to 2 points for the proposed sales tracking system, up to 2 points for successfully substituting for CFCs and up to 1 point for having separate air flows between the refrigerator and freezer, which would give consumers separate controls over the freezer and the refrigerator.

The bid scoring system had the effect of biasing the competition toward large refrigerators, which are inherently easier to redesign for large energy savings (kWh savings, not necessarily % savings).

After the initial bids were received, SERP changed the scoring to select the winner from among two finalists. That system provided up to 75 points for energy savings, as described above and all remaining points (25) were available for the proposed tracking system, reflecting the importance the utilities placed on accurate tracking of sales.

## **2.8 Promoting the Winner's Products**

The RFP stated that SERP member utilities, DOE and EPA would help the winner to promote the winning SERP models. Point-of-purchase materials would be developed that would explain the economic and environmental benefits of the SERP models. In addition, SERP member utilities would fund television and radio advertisements promoting the SERP models. However, the primary marketing responsibility remained with the winning bidder.

## **2.9 Program Results**

After agreeing to the 30 million USD competition prize goal, SERP began an aggressive recruiting campaign. Early member utilities included Southern California Edison (SCE) and Pacific Gas & Electric (PG&E). These two companies were anchor utilities, contributing 13 million USD between them. After these two committed to SERP, the program planners felt confident that their 30 million USD goal was attainable.

Although SERP suggested dollar amounts of commitment, individual utilities ultimately made their own decisions. SERP created a "projected utility payment timeline" for

utilities to follow. Each utility was given the choice to contribute their incentive money up front or follow a periodic payment schedule. The payment plan started in June of 1994, with the last payment to occur in January of 1997.

In many states, the utility regulatory commission was contacted to gain support for the program and an endorsement was obtained from the National Association of Regulatory Utility Commissioners (NARUC). As a result, the Wisconsin Public Service Commission required its utilities to participate in the program. To support the recruiting efforts, the EPA developed a spreadsheet to show utilities the cost effectiveness and potential energy savings from participation. This spreadsheet was used as a marketing tool to recruit utilities.

SERP succeeded in amassing an incentive pool of 30 million USD to run the program. In July of 1992 they issued the planned RFP. Fourteen manufacturers submitted bids in response to the RFP. In December 1992, SERP announced Frigidaire and Whirlpool as finalists and both were required to submit prototypes for testing. Ultimately, Whirlpool was selected as the winner. The winning bid proposed a combination of refrigerator sizes (22, 25 and 27 cubic feet [623, 708, and 765 liters]). All sizes incorporated side-by-side and through-the-door water and ice features and exceeded the 1993 federal standard for energy efficiency by 29.7% to 41%.

The first SERP models were shipped to dealers in February 1994. The "second generation" SERP models, which exceeded federal energy standards by 38%-41% were shipped to Whirlpool dealers in May 1995. In addition to the energy-saving features found in the first SERP units, these units also incorporated vacuum-panel insulation in the sidewalls.

To encourage retailers to complete and return sales tracking forms provided by Whirlpool, Whirlpool charged a premium of about 100 USD for each SERP refrigerator sold to retailers. Whirlpool then reimbursed those retailers for that amount after the retailers submitted the required tracking information. In Phase I of the program, Whirlpool gave the dealers a rebate as well as an incentive. Dealers received a rebate when they sent in the tracking form and an added incentive if they returned it within a specified period.

Unfortunately, Whirlpool's marketing efforts proved to be insufficient to sell all 250,000 units it had proposed to sell under the program. Whirlpool stopped manufacturing the SERP units in 1998 after selling substantially less than 250,000 units. Evaluators were unable to learn the exact number of units sold (Lee and Conger 1996).

There are several possible reasons for why this occurred. One is that the SERP model was a large, high-end product with a relatively high price when compared to the majority of refrigerators sold on the market. As mentioned above, the bid scoring system provided a strong incentive to Whirlpool to bid large refrigerators because the system gave credit for the number of kWh saved, rather than a percentage of kWh saved. The very large,

deluxe refrigerators were expensive relative to most refrigerators on the market and may have been too expensive for many refrigerator buyers to consider.

Another possible explanation for lower-than-expected sales was lack of effective promotion of the units. One evaluation of the SERP program found that inadequate dealer and salesperson understanding of the rebate structure and the sales tracking information contributed to decreased sales of the units. And many of these dealers were unaware of the Whirlpool rebates that were available to dealers for SERP unit sales, leading dealers to price them higher than they otherwise would have (Lee and Conger 1996).

Despite the low sales, it appears that SERP made lasting impacts on the refrigerator industry. For example, SERP appears to be responsible for much of the increase in the overall efficiency levels of Whirlpool's side-by-side units as well as a modest increase in the efficiency levels of other brands (Lee and Conger 1996).

With regard to the program's impact on federal efficiency standards, there is a wide range of opinion on whether the program impacted the standards, which were generally increased over the 1993 standards by roughly the same percentage improvement SERP achieved. One of the principles involved in the development of those standards stated that the SERP refrigerators had an impact on the standards. Yet a Whirlpool representative reported that the similarity between SERP efficiency levels and the new standards was a "coincidence" (Sandahl et al. 1996).

## **2.10 Contact Information**

For more information on the SERP program, contact Linda Sandahl, PNNL Program Manager. She can be reached at (503) 417-7554, or by e-mail at [linda.sandahl@pnl.gov](mailto:linda.sandahl@pnl.gov).

### **3.0 DOE High-Efficiency Clothes Washer Volume Purchase**

Resource-efficient, high-performance clothes washers use significantly less energy and water than conventional vertical-axis clothes washers. The initial cost of these machines, however, is significantly greater than the price of conventional vertical-axis washers sold in the United States. In early 1997, only one major U.S. manufacturer of washing machines (Frigidaire) was offering high-efficiency clothes washers and they had only been on the market a short time.

In order to help establish the initial market presence of high-efficiency clothes washers, the U.S. Department of Energy (DOE), through its Pacific Northwest National Laboratory (PNNL), developed a volume purchase program in partnership with the City of Austin, Texas. The program was developed after extensive consultations with clothes washer manufacturers and municipal water utilities, which were expected to be the primary users of the program. A request for proposals (RFP) was issued in September of 1997 to potential suppliers of high-efficiency clothes washers to the City of Austin and other as yet unnamed volume purchase partners. The RFP sought to offer Basic Ordering Agreements (BOAs) to suppliers for the volume delivery of high-efficiency machines at attractive prices to municipal water utilities, energy utilities, public housing agencies and other government entities. The machines had to meet minimum technical specifications and other conditions described in the RFP. Program partners seeking to take advantage of the machines at the prices and terms specified in the BOAs were responsible for developing their own programs for delivery of these machines to their final owners. DOE offered technical assistance for the development of those programs (Edgemon, Greg, and Baechler 1998).

#### **3.1 Program Origin**

In early 1997, several U.S. clothes washer manufacturers were developing high-efficiency clothes washers. In response, the U.S. DOE began exploring possible programs to help establish high-efficiency clothes washers in the U.S. market and asked PNNL to help develop a program using a technology procurement approach. PNNL researchers began meeting with organizations involved in the promotion of water-efficient technologies, primarily water utilities. This led to discussions with the members of the Conservation Division of the American Waterworks Association and member Tony Gregg, Water Conservation Division Manager for the Planning, Environmental & Conservation Services Department for the City of Austin, Texas. He stated that the City of Austin would be interested in co-sponsoring a volume purchase for resource-efficient clothes washers. Similarly, several other water utilities, especially in areas of the country experiencing water shortages, expressed serious interest in a new program using a technology procurement approach.

### **3.2 Program Goals**

The goal of this program was to stimulate the market for resource-efficient, high performance clothes washers by facilitating the sale of these units to volume buyers, primarily through municipal water utilities; thus building early sales volumes for the machines and helping manufacturers more quickly recover their investments in the new washers. The program also sought to increase consumer awareness of high-efficiency washing machines.

### **3.3 Sponsors and Participants**

Partners in this effort included DOE; PNNL; the City of Austin, Texas; Fort Lewis, Washington; and Sides Supply, Inc., an appliance supplier that won the competition to supply washers to the program. Both DOE and the City of Austin sponsored the program, with DOE taking responsibility for developing the national program and Austin taking responsibility for developing and implementing the local program which took delivery of the washers from the national program. Numerous other entities expended significant resources and time attempting to take advantage of the program including the City of San Antonio, Texas; San Diego County Water Authority, California; the Metropolitan Water District of Southern California in Los Angeles, California; the Seattle Housing Authority in Seattle, Washington; Olmstead County, Minnesota; the City of Santa Fe, New Mexico; Planergy (an energy service company); and the City of Portland, Oregon. Ultimately, however, these entities were unable to develop delivery programs before termination of the program.

### **3.4 Target Market**

To develop the large volume of purchases needed to impact the market, DOE targeted large buyer groups. It was expected that these buyer groups, termed "later local partners," would include government agencies, housing authorities, utilities, educational institutions, nonprofit institutions, energy providers, energy-services providers, builders, owner/operators of commercial or multifamily buildings and public sector agencies.

### **3.5 Program Design**

The primary design features of this program were:

- 1) extensive interaction with water utilities and volume buyers (market research), to identify their level of interest and the key features they wished to see in high-efficiency clothes washers
- 2) extensive interaction with clothes washer manufacturers, exploring their opinions on various program designs, technical issues and market issues



- 3) issuance of competitive RFPs that specified the technical requirements for high-efficiency clothes washers (and matching dryers) to be bid and that represent to potential suppliers the potential market demand for new products sold through this program
- 4) completion of basic ordering agreements (BOAs) with those suppliers whose bids were accepted in response to the RFPs
- 5) promotion, to potential program partners and buyers, of the high-efficiency clothes washers available through the BOAs, at the terms and conditions specified in the BOAs. Program washer suppliers were expected to assist in marketing the program washers and were asked to submit marketing plans with their responses to the RFP
- 6) development (with DOE assistance) and implementation of local delivery programs by local program partners.

In early 1997, PNNL staff made site visits to each major U.S. manufacturer (or anticipated manufacturer) of high-efficiency clothes washers. Furthermore, PNNL made site visits to a large number of water utilities, multi-family building owners and public housing authorities. Information from all these meetings was used to help design the program. The centerpiece of the Clothes Washer Volume Purchase Initiative was a competitive solicitation seeking the delivery of high-performance clothes washers to buyers and other program partners. PNNL used this information to compose a draft RFP, which was circulated to over 200 potential bidders and which was the subject of a pre-bidders meeting held in Austin during July 1997. After consideration of all comments, DOE issued the final RFP in September to approximately 250 washer manufacturers, distributors and retailers.

The final RFP was a two-part solicitation. Bidders could bid on Part A, Part B, or both. Part A required furnishing and delivering up to 1,000 high-performance clothes washers to City of Austin customers. Installation at the point of use, removal of the old clothes washers and after-sales service were Part A requirements.

Part B required bidders to furnish and deliver up to 10,000 high-performance clothes washers to other eligible volume purchase partners who were yet to be determined and who were called later local partners (defined in Section 3.4 above). Under Part B, bidders were asked to provide a cost per clothes washer and dryer for delivering truck-load quantities of appliances to a single delivery point within each later local partner's jurisdiction.

All washers delivered under the program had to carry a warranty covering parts and labor for a minimum of two years. Bidders were encouraged to offer superior warranties, which figured into how their bids were scored, as described in Section 3.7.

The program design depended upon Austin and "later local partners" to take advantage of the washers offered through the program. Each of these partners was expected to develop

a local program, designed according to local needs, that could take delivery of program washers.

The City of Austin's program offered exclusive services to the winner of the competitive RFP, included the following:

- promotion of the program through news releases, advertisements in the local print media and radio and television public service announcements
- fliers in the City's utility service bill
- posters and/or billboards in public places
- promotional material on City web sites
- promotional events with City officials
- customer rebates on qualifying clothes washers

Austin's promotional program was intended to serve as a model for what other local partners might offer in exchange for attractive pricing offered by bidders.

### **3.6 Technical Specifications in the Request For Proposals**

Bidders could select the brand of clothes washer they wished to supply as long as it met the following performance criteria:

- energy factor: 3.25 ft<sup>3</sup>/kWh/cycle (92 liters/kWh/cycle) minimum
- water factor: 9.5 gal/ft<sup>3</sup>/cycle (1.27liters/liter capacity/cycle) maximum
- remaining moisture content: 55% by weight maximum
- tub volume: 2.5 ft<sup>3</sup> (70.8 liters) minimum
- foot print: standard residential full size (floor space of 29 inches x 29 inches [74 cm x 74 cm] maximum)
- warranty – minimum of two-years

By replacing a traditional clothes washer with a high-performance washer meeting the above specifications, a City of Austin residential customer could save, on average, 5,600 gallons of water per year, a 40% reduction in clothes washer water use.

The specifications were set at a level that met two objectives: 1) they allowed qualification of at least three known makes of clothes washers, which, according to program designers, provided sufficient room for competition among potential bidders and; 2) they met the water and energy saving requirements of the City of Austin, as well as numerous other potential partners that had reviewed the draft technical requirements.

The energy and water factors were equal to the Tier B2 level requirement of the Consortium for Energy Efficiency's (CEE's) High-Efficiency Clothes Washer program, a program intended to encourage consistency of technical specifications among high-efficiency clothes washer programs in the United States. The remaining moisture content requirement was less stringent than CEE's Tier B2 recommended specification of 50%.

Program designers chose a less stringent remaining moisture content specification because it allowed at least three makes of clothes washers to qualify. Although the tub volume requirement required a tub size that excluded all European made clothes washers sold in the United States (as well as one U.S. made washer), the intent of the requirement was not to exclude European washers. The intent was to make certain that the washers ultimately selected for inclusion in the program had broad market appeal, which, in the opinion of program designers, required a large tub size similar to the prevailing sizes in the U.S. market.

### **3.7 Bid Scoring Formula**

Evaluation criteria for selecting the winning proposal were included in the RFP. Life-cycle cost, which included the clothes washer's purchase cost and energy, water and wastewater operating costs, accounted for 80% of a bidder's score. The quality and length of warranty programs and other after-sales service comprised another 10% of the score. The remaining 10% were based on features of the proposed marketing program.

### **3.8 Promoting the Winners Products**

A key component of the program was promotion, by DOE, of the winning bidder's products to potential program partners. DOE asked PNNL to make the program widely known to potential partners and to assist interested entities in developing local implementation programs. PNNL made several presentations at national conferences attended by companies and agencies in the target market for the program and conducted a general promotional program of mailings, press releases and articles in journals and newsletters. As listed in Section 3.3 above, a large number of potential partners were identified.

### **3.9 Program Results**

DOE received three proposals in response to the RFP. Two of the bidders proposed on Part A and Part B. One bidder proposed only on Part B. All bids were received from clothes washer distributors, each of which had independently devised clothes washer supply arrangements with clothes washer manufacturers.

Based on the bid evaluation by DOE and PNNL, Austin chose to use Part B for its program because the bid price in Part B was less than the bid price in Part A, making the Part B clothes washers more life-cycle cost effective. As a result, DOE did not award Part A to any of the bidders. In December 1997, DOE negotiated a basic ordering agreement (BOA) with Sides Supply, Inc., the winning bidder for Part B. Sides Supply, Inc. offered the Gibson Tumble Action Washer and matching electric dryer and gas dryer manufactured by Frigidaire. Austin and other local partners could purchase the clothes washers and dryers at the bid prices for a period of one year. The BOA included two

one-year optional time extensions that could be exercised with the concurrence of Sides Supply and DOE.

Although DOE had hoped to be able to offer BOAs to more than one bidder, the bids received from the other two bidders did not score high enough to support award to more than one company. DOE recognized that being dependent on a single supplier limited buyer choice in the program and if future problems developed with that supplier or its product, the program might be jeopardized.

Sides Supply offered the Gibson Tumble Action Washer for 517 USD per washer, including delivery. Matching dryers were also available for 284 USD per electric dryer and 326 USD per gas dryer. These prices were for delivery of truckload lots (minimum 42 units) to a single delivery point within the continental United States. Washers and dryers could be combined in truckload orders. For delivery to Alaska, Hawaii and Puerto Rico, the base costs were the same, but there was a delivery fee of 3,800 USD per shipping container, which will hold up to 94 clothes washers or dryers.

Although they considered it, Austin decided not to purchase and resell the clothes washers directly to customers, but instead asked local retailers to participate in the program. Willing retailers were offered the chance to take advantage of the city's clothes washer promotional program in exchange for warehousing and displaying the washers and dryers and providing delivery and installation services to Austin customers. Participating retailers could mark up the clothes washers price a maximum of 62 USD. They could also mark up the dryers, for which there was no price ceiling. Three retailers in Austin chose to sell high-efficiency clothes washers under this arrangement.

Austin offered rebates to purchasers of any clothes washer meeting Energy Star®<sup>1</sup> specifications (minimum energy factor of 2.5). The rebates were 150 USD per washer for city water and electric customers with electric water heaters and 100 USD per washer for city water and Southern Union Gas customers with natural gas water heaters. The city rebated an additional 30 USD to customers purchasing the volume purchase program Gibson Tumble Action Washer prior to June 30, 1998. A customer with electric water heating purchasing the program's Gibson Tumble Action Washer received a 180 USD rebate while a natural gas water-heating customer received 130 USD. The final clothes washer prices were 399 USD for a customer with electric water heating and 449 USD for a customer with natural gas water heating.

These prices were very low compared to the prevailing retail prices for similar high-efficiency clothes washers being sold through normal retail channels without rebates, which ranged from about 800 to 1100 USD at the time the BOA was signed with Sides Supply. A few months later, Frigidaire reduced its manufacturer's suggested retail price for its machines from 799 to 699 USD.

---

<sup>1</sup> Energy Star® is a registered mark of the U.S. Environmental Protection Agency licensed to the U.S. Department of Energy. The Energy Star® logo is used throughout the United States to promote a variety of energy efficient appliances and equipment.

When Austin's local program was launched, several local retailers complained that the city should not be getting in the business of promoting a particular washer that competed with washers they were selling. They viewed it as unfair competition by the city. The city responded by offering all appliance retailers the opportunity to sell program washers and take advantage of the city's promotional program. Furthermore, Austin pointed out that non-program washers meeting the program's technical specifications would also be eligible for city-sponsored rebates. The controversy was quickly quelled and Austin proceeded with implementing their program as they had proposed.

About two months prior to the scheduled expiration date of the BOA, Sides Supply and Frigidaire informed DOE that they did not wish to exercise the option of extending the BOA for another year. Frigidaire informed DOE that they were selling 100% of their production through other channels and it therefore didn't make sense to continue selling the heavily discounted washers through this program. Program staff initially reacted with disappointment, in that efforts to include other local partners in the program appeared to be progressing well and now these partners would be denied the chance to participate. Nonetheless, staff took satisfaction in knowing that the new washers were being accepted so well in the U.S. market that intensive efforts, such as this program, appeared less necessary than only a short time ago.

At the conclusion of the program, on December 19, 1998, a total of 579 washers had been sold through the program, substantially less than the program sales target of 10,000 washers. All but 42 of those washers were sold to customers in Austin.

Austin is seeking to continue operating its local program under an independent agreement the city is negotiating with Sides Supply. Clothes washers sold through the new independent program would sell for approximately 50 USD more than under the program operated in partnership with DOE. With this new arrangement, Austin would stand a good chance of meeting the sales goal originally set for Austin under Part A of the RFP.

As stated in Section 3.3 above, numerous other potential program partners attempted to develop local programs that could take advantage of the program, but none of these efforts resulted in the implementation of a program. This occurred primarily because these potential partners ran out of time before the December 1998 program termination. Most of these potential partners, including San Antonio Water Supply, the Seattle Housing Authority, Olmstead County, Santa Fe and the Metropolitan Water District of Southern California had been working through local processes to develop programs when the program terminated. Program designers simply underestimated the amount of time needed for local partners to develop programs and overcome obstacles they encountered. San Antonio almost succeeded in putting in place a program to take delivery of the washers, but when Frigidaire made a small design change in the program washer (and subsequent change in the washer's model number), lawyers for the city required San Antonio staff to repeat a competitive solicitation for local retailers, causing so much loss of time that San Antonio could not begin the program until after December 1998. The Seattle Housing Authority literally raced the clock to December 19, 1998, to arrange a

large purchase for one of their contract developers, but logistical problems prevented its completion.

Program staff view the High-Efficiency Volume Purchase program as a mixed success. The staff viewed several program outcomes as disappointing:

- 1) Only 579 washers were sold relative to the goal of 10,000 units
- 2) Only two local partners took advantage of the program
- 3) The controversy with retailers in the Austin area caused some potential local partners to balk at participation in the program
- 4) The BOA was terminated after one year; neither of the two optional one-year extensions was exercised

While sales were disappointingly low compared to the sales target, staff view several program outcomes as indicators of partial success:

- 1) Aggressively priced bids were generated by the RFP, particularly the winning bid, which offered washers for approximately 300 USD less than available at regular retail prices (not considering the effect Austin's rebates had on final washer prices).
- 2) Enthusiastic response from Austin program customers.
- 3) Program washer sales were robust in the City of Austin.
- 4) Numerous potential local partners attempted to develop programs to take delivery of the programs washers.
- 5) The program was terminated because the washer manufacturer was able to sell 100% of its production without the assistance of this kind of program.

### **3.10 Contact Information**

For more information on the DOE High-Efficiency Clothes Washer Volume Purchase, please contact Sandi Edgemon, PNNL Staff Engineer, at (509) 372-4583. She can be reached via e-mail at [sandi.edgemon@pnl.gov](mailto:sandi.edgemon@pnl.gov).

## **4.0 DOE Sub-CFL Technology Procurement Program**

This program is a technology procurement initiative designed by the U.S. Department of Energy (DOE) and its Pacific Northwest National Laboratory (PNNL) to transform the market for compact fluorescent lamps (CFLs). Market research conducted during the design phase of the program indicated that the primary barriers to increased sales of CFLs to volume buyers were high CFL prices and the difficulty of making CFLs fit in many common lighting fixtures. DOE therefore designed a program to help reduce the price of CFLs to volume buyers and to encourage manufacturers to offer smaller CFLs to the market. (These smaller lamps are known as “sub-CFLs”.)

The program consists of two phases: Phase I, which ended on October 31, 1998, was an introduction and demonstration phase, with a modest sales target of 5,000 to 15,000 sub-CFLs over a three-month period. Phase II, which began on October 31, 1998, is the full implementation of the program, with a much more aggressive sales target of one million lamps. Phase II is planned to last through October 1999, with a six-month optional extension.

Two Requests for Proposals (RFPs) were sent to CFL manufacturers and distributors, one RFP for Phase I and one RFP for Phase II. The RFPs requested bids for the delivery of Sub-CFLs. The winners of the RFP sell their products in volume directly to volume buyers, such as multi-family building owners/operators, universities, public housing authorities, hotel/motel companies, federal agencies, and lighting product resellers. No subsidies were offered in this program by DOE to either suppliers or buyers of the sub-CFLs.

### **4.1 Program Origin**

This program originated from DOE's involvement in the Super-Efficient Apartment Size Refrigerator Program conducted by the New York Power Authority and Consortium for Energy Efficiency (CEE). As a result of that program, DOE began working with private multi-family housing owners and operators (PMFOs), seeking opportunities to help these companies purchase more energy-efficient appliances, including dishwashers, refrigerators and clothes washers. After some initial strong expressions of interest among these companies in the idea of organizing projects to test the rental market response to the use of more efficient appliances, program staff decided to postpone these efforts because too many market barriers were encountered. The very substantial incremental cost of efficient appliances, relative to the cost of appliances that were typically installed by the industry, proved to be a formidable obstacle.

As a result, DOE began to explore technology improvements that required less capital outlay and suggested a program to encourage PMFOs to consider purchase of Energy Star® lighting fixtures, specifically, dedicated CFL fixtures (lighting fixtures using pin-

based CFLs) for outdoor and common areas. The developers, however, stated that even the expense of CFL lighting fixtures and particularly the labor expense of retrofitting them in existing buildings, made them an unattractive candidate for a joint project with DOE. The investment conservatism of the industry proved to be a formidable obstacle to the organization of a collaborative project.

DOE then proposed integral CFLs, a very-low-cost technology, hoping that successful completion of a low-cost, low-risk project would help make the industry more comfortable in working with DOE and make possible future projects involving higher capital outlays by the industry. The suggestion was well received, but the discussions with the industry quickly identified two major market barriers to widespread use of CFLs: price and size. PMFO buyers complained that most CFLs were too expensive and too long to fit into most of the existing lighting fixtures in their buildings. Fortunately, PNNL researchers soon became aware of new CFLs that were significantly shorter than the CFLs commonly available. These so-called sub-CFLs were just being introduced to the market. This discovery led to discussions with CFL manufacturers and PMFOs and ultimately to the program described here.

## **4.2 Program Goals**

The long-term goal of this program is to greatly expand the market for CFLs by inducing manufacturers to develop and sell new CFLs that are shorter and lower cost than most CFLs presently in the market. The program is designed to address two major market barriers: size and price. Most CFLs on the market are too long to fit many common fixtures. This program seeks to overcome this barrier by creating attractive sales opportunities for lamp manufacturers to develop new, smaller CFLs that fit in virtually any fixture designed for screw-based lamps. By aggregating the buying power of PMFOs and other volume purchasers and then expressing this market demand through RFPs that offer suppliers a chance to sell their new products directly to these buyers, DOE hopes to

- 1) induce manufacturers to introduce new products to the market generate sales volumes substantial enough to allow manufacturers to offer low product prices
- 3) increase the visibility of sub-CFLs in the marketplace.

## **4.3 Sponsors and Participants**

Participants in this program include the U.S. DOE, PNNL and the CFL manufacturers that supply sub-CFLs in the program, namely Sunpark Electronics, Duro-Test, Link USA, and Lights of America. U.S. DOE sponsors the program.



## **4.4 Target Market**

This program is designed to target volume buyers, including PMFOs, universities, public housing authorities, hotel/motel companies, government agencies and electric utilities.

## **4.5 Program Design**

The primary features designed into this program are:

- 1) extensive interaction with potential buyers (market research), to identify the project technology and the features of that technology requiring improvement and to guide the overall program design
- 2) extensive interaction with CFL manufacturers, to determine technology opportunities and issues of importance to manufacturers and to guide the overall program design
- 3) issuance of competitive RFPs, that specified the desired technology and that represent to potential suppliers the potential market demand for new products defined in the RFPs
- 4) completion of basic ordering agreements (BOAs) with those suppliers whose bids were accepted in response to the RFPs
- 5) promotion, to potential buyers, of the sub-CFLs available through the BOAs, at the terms and conditions specified in the BOAs.

Key to this program are the two RFPs. The first, issued in April of 1998 during Phase I of the program, requested manufacturers and other lamp suppliers to submit proposals for the delivery of sub-CFLs. Phase I was a demonstration phase to determine whether volume buyers and sub-CFL suppliers would respond to the products being offered and to test program logistics. Phase I helped to introduce sub-CFLs to the marketplace. The expectation was that the program would attract many first-time CFL users who were currently unaware of the sub-CFL technology, but would use it if the price were attractive.

The Phase II RFP sought to increase the number of low-cost, shorter and brighter CFLs available in the marketplace. When the Phase I RFP was issued, bidders could indicate if they wanted to participate in both phases, or only in Phase II.

## 4.6 Technical Specifications in the Request For Proposals

In order to be considered for Phase I of the program, the lamps needed to meet the following technical specifications:

- maximum overall length: 5.25 inches(13.33 cm) for 15-16 watts (W) lamps; 5.5 inches (13.97 cm) for 18-20 W lamps; and 6.0 inches (15.24 cm) for 23-26 watt W lamps
- maximum overall width: 2.5 inches (6.35 cm)
- other physical characteristics: self-ballasted, fully enclosed ballast and UV resistant ballast housing
- power factor (PF): either 0.5 minimum for lamps submitted as mid-PF lamps and 0.9 minimum for lamps submitted as high PF-lamps
- color rendering index: 82, minimum
- corrected color temperature: between 2700K and 3000K
- operating voltage: 120 volts at 60 Hz
- luminous efficacy: 60 lumens per watt
- noise: sound rated A
- rated life: 6000 hour minimum
- minimum starting temperature: no higher than -20 degrees Fahrenheit (-29 degrees C)
- light output at low temperature: 50% of full output at 0 degrees Fahrenheit (-18 degrees C)
- lamp lumen depreciation: 20% over rated life maximum
- illumination delay: 1 second maximum
- warranty: one year minimum.

The size specifications for each wattage category were set at a level that would allow at least two products already in the market to comply with them. This approach was selected because program designers believed that more aggressive size specifications were not appropriate for Phase I, given that it was a demonstration phase; and because it allowed potential buyers to bid existing product to become familiar with the program before making investments in reducing the size of their products.

The technical specifications for Phase II were almost identical to those used in Phase I, except for two criteria. First, the maximum overall width was increased to 2.625 inches (6.67 cm) for bulbs over 23W. Second, a new category of bulbs over 30W was added. These bulbs were required to meet all of the criteria for the other bulbs, except that they could be up to 7 inches (17.8 cm) in overall length. Despite the fact that the maximum size specifications were not made more stringent in Phase II, program designers sought reductions in the size of lamps being offered, which is described in Section 4.7 below.

The warranty requirement deserves special note. Given that many of the potential buyers for these products were unfamiliar with CFLs and given that a number of CFLs available

in the market were failing prematurely, the RFP required that lamps offered for sale through this program had to come complete with a very strong warranty. The RFP stated that,

Offeror shall offer a standard warranty service package fully covering CFL performance and failure for one (1) year from date of purchase...Customers shall not be financially responsible for returning a defective CFL to the manufacturer to exercise warranty rights if a fully functioning CFL is returned within 30 calendar days, or if a CFL fails to perform to the minimum technical specifications within one (1) year of purchase.

## **4.7 Bid Scoring Formula**

DOE and PNNL reviewed the proposals submitted under Phase I based on the following evaluation criteria: 1) product price, which constituted 80% of the final score; 2) extent of product warranty, which constituted 10% of the final score; and 3) a ratio of cost/life of the lamps, which constituted the remaining 10% of the final score.

Because a main objective of Phase II was to increase the number of shorter lamps available in the market, the scoring criteria were changed to make size an important factor in determining lamps selected for award of BOAs. The revised scoring criteria for Phase II were as follows: 1) product price (50%); 2) product length (30%); 3) extent of product warranty (10%); and 4) a ratio of cost/life (10%).

## **4.8 Promoting the Winner's Products**

Sub-CFL purchases are facilitated with electronic ordering. Suppliers are required to provide DOE a toll-free telephone number and a toll-free fax number, which DOE will make available to the buyers. Suppliers are encouraged, but not required, to provide DOE an Internet link and product information sufficient for a web site presentation. DOE has set up a web site with a description of the CFL volume purchase program, a description of the products available through the volume purchase (including prices) and the toll-free telephone and fax numbers of the suppliers. If a supplier provides an Internet link for direct Internet ordering, DOE includes that link and related information in the CFL volume purchase web site. DOE's website for this program is <http://www.energystar.gov/volumepurchase.html>.

## **4.9 Program Results**

### **Phase I**

In Phase I, three suppliers, Sunpark Electronics, Lights of America and Link USA International, were selected to be the sub-CFL suppliers for the program. They signed BOAs that specified the prices and other terms under which they would deliver sub-CFLs to buyers accessed through this program. These suppliers offered products ranging from 15 to 25 watts, with delivered prices ranging from 5.85 USD for 15W sub-CFLs to 10.45

USD for 26W sub-CFLs. Table 4.1 lists all products made available through the Phase I BOAs and their prices.

The suppliers were selected from among seven bidders. Program staff believed that the number of bidders and the aggressiveness of their bids were strong indications of the program's potential and were positive indicators of appropriate program design.

As described above, Phase I was intended to test the logistics of the program and to determine how responsive both buyers and potential suppliers would be to the program. Program staff were surprised, however, by the submission of bids during Phase I that offered products that were not already available in the U.S. market. All three of the bidders that were finally selected in the program offered new products. Link USA redesigned and shortened their sub-CFLs in response to the program and Sunpark and Lights of America offered new products in the United States through this program at the same time they began offering these new products through other delivery channels. These offerings came as a surprise because program designers didn't think the identified potential sales in Phase I were large enough to cause potential suppliers to redesign products or to make arrangements for offering new products.

Table 4.1: Phase I Sub-CFL Products And Prices

Company, Model and Wattage	Lamp Life (hrs) and Power Factor	Length in inches (cm)	Delivered Price Per Lamp (a) (b)			
			Zone 1	Zone 2	Zone 3	Zone 4
<b>Link USA</b>						
SLKG 60 15W	10000 Mid PF	5.00 (12.7)	\$7.90-\$9.15	\$7.95-\$9.25	\$8.00-\$9.30	\$8.10-\$9.45
SLKG 75 20W	10000 Mid PF	5.000 (12.7)	\$8.40-\$9.65	\$8.45-\$9.75	\$8.50-\$9.80	\$8.60-\$9.95
SLKG125 26W	10000 Mid PF	5.500 (14)	\$8.90-\$10.15	\$8.95-\$10.25	\$9.00-\$10.30	\$9.10-\$10.45
<b>Sunpark</b>						
SP15S 15W	8000 Mid PF	5.125 (13)	\$5.85-\$7.49	\$5.85-\$7.41	\$5.85-\$7.39	\$6.75-\$9.30
SP15S 15W	8000 High PF	5.125 (13)	\$6.10-\$7.74	\$6.10-\$7.66	\$6.10-\$7.64	\$7.00-\$9.55
SP20S 20W	8000 Mid PF	5.500 (14)	\$6.06-\$7.75	\$6.06-\$7.67	\$6.06-\$7.65	\$6.96-\$9.56
SP20S 20W	8000 High PF	5.500 (14)	\$6.31-\$8.00	\$6.31-\$7.92	\$6.31-\$7.90	\$7.21-\$9.81
SP23S 23W	8000 Mid PF	5.75 (14.6)	\$6.30-\$8.02	\$6.30-\$7.94	\$6.30-\$7.92	\$7.20-\$9.83
SP23S 23W	8000 High PF	5.750 (14.6)	\$6.55-\$8.27	\$6.55-\$8.19	\$6.55-\$8.17	\$7.45-\$10.08
<b>Lights of America</b>						
Model 2420 Twister 20 W	10000 Mid PF	5.15 (13.1)	\$8.36-\$9.26	\$8.36-\$9.26	\$8.36-\$9.26	\$8.40-\$9.26
(a) Each zone represents a geographic region in the United States. Suppliers generally charge higher prices for shipping to more distant zones.						
(b) Price ranges in each cell are determined by the quantity of Sub-CFLs ordered, with the low end of the range representing the minimum order quantity of 7 or 10 (depending on the supplier) and the high end of the range representing an order quantity of at least 1000 lamps.						

Although Phase I of the program had a sales target of 5,000 to 15,000 lamps, over 80,000 sub-CFLs were sold during a four-month period ending on October 31, 1998. The majority of sales were made by the supplier with the lowest cost lamps, Sunpark

Electronics. The largest volume sales were made to electric utilities, which purchased them for use in their energy efficiency programs.

## **Phase II**

In Phase II, even more aggressive bids were submitted than in Phase I. Five sub-CFL suppliers were selected for award of BOAs from among seven bidders. These were Sunpark Electronics, Lights of America, Link USA, Duro-Test and Lightforce. Participation by Lightforce was suspended soon after they were awarded a BOA because the company identified a problem with product certification according to the ANSI standards stated in the RFP, for which the company had previously certified compliance. Resolution of this certification problem is pending. The remaining four manufacturers offer products ranging from 15 to 26 watts, with delivered prices ranging from 6.10 USD for a 15W bulb to 24.82 USD for a 26W bulb delivered to a U.S. territory (Zone 5). (See Table 4.2 for a complete listing of products and pricing.) The BOAs with these suppliers are valid for a one-year period beginning on October 31, 1998 and contain an optional six-month extension that can be exercised with the concurrence of both the suppliers and DOE.

Discussions are still underway with a sixth potential supplier to the program. Its bid submission is still being evaluated by program staff. Resolution of outstanding issues is expected this winter.

As in Phase I, no bids were received from any of the major three lighting manufacturers, however, both Duro-Test and Lights of America are sizeable manufacturers with broad product lines.

Phase II BOAs were signed at the end of October, 1998. Given that sales under Phase II of the program only recently began, program sales volumes were not yet available.

The three suppliers that offered new-to-the-market products in Phase I offer the same products in Phase II. In addition, Lights of America offers their new product in a new wattage that was not available in Phase I (20 W). If outstanding issues with the potential sixth supplier are concluded successfully, several newly designed products will be brought to market. (The name of the company and the details of the lamps bid by the sixth supplier cannot be made public until a BOA is signed.)

## **4.10 Contact Information**

For more information on this program, contact Terry Odell, PNNL Program Administrator. She can be reached at (509) 372-4333 or [theresa.odell@pnl.gov](mailto:theresa.odell@pnl.gov).

Table 4.2: Phase II Sub-CFL Products And Prices

Company, Model and Wattage	Lamp Life (hrs) and Power Factor	Length in inches (cm)	Delivered Price Per Lamp (a) (b)				
			Zone 1	Zone 2	Zone 3	Zone 4	Zone 5
<b>Duro-Test</b>							
Durolite 15 15W	8000 Mid PF	5.00 (12.7)	\$7.40-\$8.65	\$7.45-\$8.75	\$7.50-\$8.80	\$7.60-\$8.95	\$8.85-\$10.95
Durolite 20 20W	8000 Mid PF	5.25 (13.3)	\$7.95-\$9.20	\$8.00-\$9.30	\$8.05-\$9.35	\$8.15-\$9.50	\$9.40-\$11.50
<b>Lights of America</b>							
2415C 15W	10000 Mid PF	4.6875 (11.9)	\$8.36-\$8.96	\$8.36-\$8.96	\$8.36-\$8.96	\$8.36-\$8.96	\$8.36-\$8.96
2420C 20W	10000 Mid PF	5.1875 (13.2)	\$8.36-\$8.96	\$8.36-\$8.96	\$8.36-\$8.96	\$8.40-\$8.96	\$8.60-\$9.61
<b>Link U.S.A.</b>							
SLKG60 15W	10000 Mid PF	5.125 (13)	\$6.23-\$7.45	\$6.28-\$7.55	\$6.33-\$7.60	\$7.00-\$11.18	\$10.51-\$23.22
SLKG75 20W	10000 Mid PF	5.125 (13)	\$7.10-\$8.15	\$7.15-\$8.25	\$7.20-\$8.30	\$7.87-\$11.88	\$11.38-\$23.92
SLKG125 26W	10000 Mid PF	5.50 (14)	\$7.80-\$9.05	\$7.85-\$9.15	\$7.90-\$9.20	\$8.57-\$12.78	\$12.08-\$24.82
<b>Sunpark</b>							
SP 15SL 15W	8000 Mid PF	5.20 (13.2)	\$6.10-\$7.74	\$6.10-\$7.66	\$6.10-\$7.64	\$6.95-\$7.79	\$6.95-\$7.79
SP 15S 15W	15-16 W High PF	5.20 (13.2)	\$6.35-\$7.99	\$6.35-\$7.91	\$6.35-\$7.89	\$7.20-\$8.04	\$7.20-\$8.04
SP 20SL 20W	8000 Mid PF	5.20 (13.2)	\$6.31-\$8.00	\$6.31-\$7.92	\$6.31-\$7.90	\$7.16-\$8.05	\$7.16-\$8.05
SP 20S 20W	8000 High PF	5.20 (13.2)	\$6.56-\$8.25	\$6.56-\$8.17	\$6.56-\$8.15	\$7.41-\$8.30	\$7.41-\$8.30
SP 23SL 23W	8000 Mid PF	5.60 (14.2)	\$6.55-\$8.28	\$6.55-\$8.20	\$6.55-\$8.18	\$7.40-\$8.33	\$7.40-\$8.33
SP 23 S 23W	8000 High PF	5.60 (14.2)	\$6.80-\$8.52	\$6.80-\$8.44	\$6.80-\$8.42	\$7.65-\$8.57	\$7.65-\$8.57
(a) Each zone represents a geographic region in the United States. Suppliers generally charge higher prices for shipping to more distant zones.							
(b) Price ranges in each cell are determined by the quantity of Sub-CFLs ordered, with the low end of the range representing the minimum order quantity of 7 or 10 (depending on the supplier) and the high end of the range representing an order quantity of at least 1000 lamps.							

## 5.0 Lessons Learned

Evaluation of the technology procurement programs discussed in the preceding sections and consideration of what did and didn't work during program development, design and implementation yields a number of lessons that might be considered by others running technology procurement programs. The lessons are discussed below.

### 5.1 Program Development Lessons

- *The program development process should be **buyer** driven. In other words, the interests of buyers, their issues and concerns, market perspectives and willingness to buy should have heavy influence on the development and design of a program.*

Perhaps the best example of this lesson comes from the DOE CFL Technology Procurement Project. DOE invested almost a year in working with the private multi-family owner/operator industry (PMFO). DOE initially explored this industry's interest in efficient household appliances and there was initial serious interest among some major companies, but management changes in those companies and the new management's concerns about the cost of efficient appliances caused those companies to lose interest in such projects. Furthermore, numerous other PMFOs were very reluctant to make such investments. Subsequently, DOE explored the possibility of working with these companies on a project focused on Energy Star® lighting fixtures and again encountered the same resistance. Companies argued that the labor and capital costs of new lighting fixtures were still too high for them. Only when DOE proposed the low-cost measure of retrofitting integral CFLs in fixtures designed for incandescent lamps did the PMFOs respond with interest. They made it clear that they would be interested in buying these lamps, if they were smaller, cheaper and brighter, which were all used as primary design goals for the DOE Sub-CFL Technology Procurement project.

In the opinion of the authors, too many government or utility-sponsored energy-efficiency programs in the United States are driven by technology advocates, whose enthusiasm for a particular technology or design feature is given more weight in program design than the intended buyers of the target technology, resulting in programs that are less effective than they could be.

- *Even though the program development process should be buyer driven, program developers should nonetheless interact extensively with potential suppliers of the technology being sought. Such interaction is important to learn about key technology and market issues from the supply side of the market.*

All of the technology procurement projects reviewed in this report engaged manufacturers extensively during the program development phase and these efforts consistently yielded good information to guide development of the projects. The



reasonableness of proposed technology specifications and the capability of manufacturers to meet these specifications were discussed in all projects. An example of the importance of these discussions can be found in the DOE Sub-CFL Technology Procurement project. In developing the specifications for these lamps, DOE first considered specifications that had been developed by EPA for the Energy Star® Lighting fixtures program and numerous other CFL programs run by electric utilities. Many of these programs contained a specification requiring that the power factor for CFLs be at least 0.9 and the current total harmonic distortion not exceed 33%. In discussing these requirements with CFL manufacturers, they unanimously agreed that these requirements were unnecessary, for a range of reasons. A long investigation and discussion ensued with many parties, including target buyers and in the end, the program specifications allowed suppliers to provide products meeting much less stringent power quality requirements. (It is worthwhile to note that partly in response to these discussions, several large electric utilities in the United States have decided to reduce the stringency of their power quality requirements.)

- *Not only is it important to understand the market from the perspectives of the buyers and producers, as described in the above two lessons, it is also very important to thoroughly understand the conventional delivery channels for the types of products or technologies that are the focus of a technology procurement project.*

The program experience of both SERP and the DOE High-Efficiency Clothes Washer program indicate that implementation problems could have been avoided with better understanding of the delivery channels used in those projects. In the case of SERP, a large number of retail stores were unaware of the availability of manufacturer-provided rebates for selling SERP units. Consequently, SERP units were priced much higher at many of those stores than they would otherwise have been, which hurt the consumer attractiveness of these models.

In the case of the DOE Clothes Washer Program, a number of retailers in the Austin area viewed the program as a competitor to their business. Only after a controversy arose did Austin program staff, with the help of Sides Supply, engage these retailers, consider their issues and then implement the program in a way that calmed the controversy. In the opinion of Austin's local program manager, had Austin never mentioned the possibility of the city directly buying and reselling clothes washers to its citizens, the controversy would not have materialized.

Both of the examples show the importance of understanding and communicating with the product supply channels that will be affected by a procurement program, particularly if that supply channel might view the procurement program as competing with its business.

- *In procurement projects aimed at products that have relatively low capital requirements for starting new production, small manufacturers can be important agents of change in the market.*

In SERP, program designers made a deliberate decision to exclude small refrigerator producers because their program design required a producer that had an existing national sales network, with established connections to the national appliance retail network. In the DOE Clothes Washer program, program designers knew that the capital requirements for clothes washer production, expressed consumer preference for name-brand products and market knowledge of which companies were capable of producing the required product, all weighed heavily in favor of working with a major manufacturer. Bids from small producers were not ruled out; they just weren't expected and therefore little effort was expended in interacting with small potential bidders.

On the other hand, the DOE Sub-CFL program had elements that increased the attractiveness and likelihood of working with small companies. Several small companies had shown innovative products at recent trade shows; buyers had revealed a willingness to buy products from small producers; and the capital requirements for developing and marketing new CFLs were substantially lower than for refrigerators or clothes washers, especially considering contract production possibilities. DOE thus invested significant time interacting with small CFL producers. Several of these producers were awarded BOAs in the program. They have proved to be quick and nimble in bringing forth new product and in seizing market opportunities. Two of these producers were able, in less than two months time, to redesign products in response to DOE suggestions and submit prototypes for DOE's review.

- *Given that technology procurement programs are based on market intervention, try to anticipate which companies and industries might perceive your program as competition; approach them before program implementation to explain the intent of your program and to understand their concerns.*

Like almost all programs seeking to encourage acceptance of new energy-efficient products, technology procurement programs intervene in the market and cause a change in the status quo. These changes inevitably affect some companies' or industry's business. As in the case of the clothes washer program, these changes can cause controversy. Sufficient time should be devoted to efforts to anticipate which companies or industries might be affected by the program. To the extent program resources allow, these companies should be engaged in a dialogue that allows these companies to identify problems that might be avoided during program implementation. However, in the words of one local program manager, "there is always going to be controversy, but it doesn't mean you don't have a good program."

## **5.2 Program Design Lessons**

- *Unless circumstances strongly indicate otherwise, it is preferable to make more than one award in response to competitive solicitations.*

Of the three programs reviewed in this report, two had made single awards in response to competitive solicitations: SERP and the DOE High-Efficiency Clothes Washer program. Both Phase I and II of the DOE Sub-CFL program made multiple awards.

SERP made a deliberate decision during program design to make only one award. That decision was based on the collective decision of program designers that offering more than one award would dilute the financial benefit of winning the program and thereby make it difficult (if not impossible) for any refrigerator manufacturer to justify the large expense of setting up a new refrigerator production line. This decision was made after intense debate among program designers, many of whom argued that making a single award made the program too dependent upon a single company.

Whether more than one refrigerator manufacturer would have set up a new production line for refrigerators had the program offered two awards will never be known. It is possible that no company would have accepted the costs of producing a new refrigerator had it been required to share in the rebates offered by SERP. But SERP's sole dependence on Whirlpool caused many implementation problems for SERP. SERP was subject to Whirlpool marketing the refrigerators less aggressively than they had expected and moving slower than they had expected. Had a second SERP manufacturer been involved, competitive pressures between the two would probably have caused both manufacturers to market aggressively and move quickly, lest the other manufacturer reap most of the financial benefit of SERP. And two manufacturers would have given consumers a wider range of products to choose from, probably increasing sales of SERP refrigerators.

Program designers for the DOE High-Efficiency Clothes Washer program expressed a clear preference for multiple awards, knowing that their program was not going to require (nor entice) manufacturers to set up new production lines. Designers also wanted a program with broader consumer choice than would be allowed by having a single program supplier. However, after scoring the bids received in response to the RFP, there was only one clear winner, so a single BOA was awarded. As mentioned in Section 3.0, this ultimately caused the program to terminate earlier than had been expected. When Frigidaire announced that it did not want to continue supplying the program into the optional time extension period, the program was left without another supplier it could turn to.

Program designers of the DOE Sub-CFL program also expressed a clear preference for multiple awards. They knew that capital requirements for producing new CFLs and market conditions weighed in favor of multiple awards. Thus far, the program has benefited greatly from having multiple suppliers. For example, one of the companies originally awarded a BOA was suspended from the program, but given that there were three other suppliers already approved, that was only a small setback for the program. Also, multiple suppliers has increased the range of products available to buyers, for which buyers report satisfaction.

- *If market and technology conditions allow it, a demonstration phase can be very useful in identifying potential suppliers and buyers, appropriateness of specifications and functionality of program logistics.*

The only program reviewed in this report to have implemented a demonstration phase is the DOE Sub-CFL program. During the development of this program, it became apparent that there were market and technology conditions that would allow a demonstration phase. Furthermore, program designers indicated that a demonstration phase would be very useful in testing a number of program design hypotheses.

The *market* conditions that weighed in favor of a demonstration phase were as follows:

- 1) Several new sub-CFLs had recently been introduced in the U.S. market making it possible for bidders to respond to the RFP without having to develop new product; a low-sales volume demonstration phase would therefore have a reasonable chance of attracting bidders.
- 2) There were not large up-front costs associated with setting up product promotion, order filling and product delivery mechanisms. Product promotion consisted primarily of a number of mailings, some conference presentations and direct contact with potential volume buyers and trade associations. The web-based ordering system was low-cost and most potential suppliers already had operations in place for handling large volume orders to customers scattered across the country.

The *technology* conditions that weighed in favor of a demonstration phase were as follows:

- 1) The cost of the target technology was relatively low (most less than 10 USD each), making it possible for purchasers to try the products without large expenditures.
- 2) The target technology was small and light, making it possible to rely on mail delivery of the products to the buyers. Contrast this condition with that of refrigerators or clothes washers, which rely on local warehousing and expensive delivery and installation.

The Phase I demonstration proved useful in many ways. It helped identify potential suppliers, some of which program developers had not been in contact with during program development. It tested the appropriateness of the specifications and indicated that a number of companies could meet the rather stringent specifications. It identified a number of large buyers previously not contacted by program developers, particularly large electric utilities that have been enthusiastic users of the program. The product testing done on Phase I lamps revealed some needed improvements in the lamps that were made prior to implementation of Phase II. Phase I also gave program designers the confidence to push for further reductions in lamp size for Phase II.

- *Although technology procurement projects have heavily relied upon guaranteed sales or exclusive access to large financial awards (SERP), DOE's clothes washer and*

*sub-CFL programs have demonstrated that they are not always necessary to attract aggressive bids.*

DOE's clothes washer and sub-CFL procurement projects relied primarily on offering bidders attractive selling opportunities, rather than guaranteed sales. In the case of the sub-CFL program, bidders were offered DOE's assistance in helping them access certain target markets. Bidders indicated that having DOE involved helped them establish credibility for their products. Bidders for the DOE clothes washer program were offered similar assistance. (Note though that Part B of the RFP - which addressed Austin's program needs - included consumer rebates on the list of marketing assistance.)

In both programs aggressive bids were received and bidders indicated both through the action of their bids and through subsequent questioning, that the absence of guaranteed sales in being awarded a BOA did not make them reluctant to submit a bid (Scott, Parker and Currie 1998).

- *Strong product warranties are an essential component of technology procurement programs.*

All products offered through the programs reviewed in this report offered strong product warranties. Whirlpool offered its standard refrigerator warranty, most likely because it looked to consumers like other refrigerators they were familiar with. Frigidaire offered a warranty on the product sold through the DOE program that was the same as the one it used for other sales channels, but this warranty was superior to the warranty Frigidaire offered on its line of conventional clothes washers.

The warranty offered on the sub-CFLs is particularly valuable, given that most buyers are not familiar with CFLs or with the manufacturers of the products offered through the program. During program design, DOE decided that a superior warranty was necessary to induce buyers to purchase unfamiliar products from unfamiliar companies. Interviews with a number of buyers have confirmed the importance of the warranty in their purchase decision. Some of these buyers purchased products early in Phase I, found they didn't start outdoors in very cold temperatures as specified, returned the products for refunds and then purchased replacement product when the cold start problem had been corrected.

- *Technology procurement programs that depend on sales to large volume buyers, particularly government agencies, should be designed to allow a long period of time (at least one to two years) for the target buyers to purchase product.*

Large companies, institutions and especially government agencies typically have rigid purchasing processes that work best when they continue to purchase items they normally purchase, through the same channels they normally use. When they are asked to consider purchasing new products - especially ones that are more expensive than their normal purchases - processes typically slow down, many more people are involved in decisions, regulatory or company policy barriers are encountered and the purchase gets bogged

down. If this time-consuming process is not accounted for in the program from the beginning, the risk of program failure increases.

A good example of this is the DOE clothes washer volume purchase. Program developers underestimated the amount of time it would take to work municipal water agencies, housing authorities and large project developers through the process of buying washers through the program. As described in Section 3.0, there were a number of potential buyers that were still working through their processes for arranging the purchases when the program terminated. These organizations didn't begin their efforts as soon as the washers became available in the program; it took many months for most of them to learn about the program. The City of San Antonio, however, worked on development of its program for most of a year and still didn't have it in place when the program terminated. (Had Frigidaire not redesigned its washer and assigned a new model number to it, San Antonio would have been able to put a local program in place before the termination of the DOE program, but only by a few months.)

Although not reviewed in this report, the Super-Efficient Apartment Size Refrigerator Program is another good example of this lesson. With DOE's assistance, the Consortium for Energy Efficiency heavily marketed the program to public housing authorities around the country. Many of those purchases required an extensive amount of technical and logistical assistance and most of them took many months to put in place.

- *Technology procurement projects not offering guaranteed sales or exclusive access to financial assistance are more successful when attempting modest incremental improvements in technology, not big leaps forward.*

SERP did not require a radical improvement in refrigerator technology, but the technology change required was one that required a very substantial investment by Whirlpool in its refrigerator production line. It is unlikely this change would have been achieved without the offer of exclusive access to utility rebate funds. The DOE Sub-CFL program, on the other hand, sought a relatively modest improvement in technology. Had it sought a larger improvement, it is unlikely that the program as designed, without a large volume of guaranteed sales, would have succeeded in inducing manufacturers to bring such new product to market.

- *Having institutions that are recognized for objectivity, consumer interest, or technical expertise involved in the development and implementation of technology procurement programs can contribute significantly to the success of such programs.*

In all of the programs reviewed in this report, both companies and individuals that have participated in the programs have frequently cited the importance of having DOE, PNNL, or certain utilities involved in the development and implementation of the programs. DOE, as a federal government agency, helps the programs to be perceived as fair, objective and in the interest of consumers. PNNL, as a DOE national laboratory, helps the programs to be taken seriously by technology developers. And the utilities have been

able to consistently demonstrate that their customers trust their recommendations on new technologies.

- *Technology procurement programs can be a viable and effective alternative to technology introduction programs that rely on large subsidies.*

A large fraction of energy-efficiency programs recently implemented by electric utilities in the United States relied heavily on subsidies (rebates) to reduce the prices of energy-efficient products. Market research conducted in support of these programs typically revealed that high prices for energy-efficient products was a leading barrier to their widespread market acceptance. On the other hand, of the three programs reviewed in this report, two (sub-CFLs and clothes washers) did not use the offer of subsidies to reduce the cost of energy-efficient equipment to buyers (SERP used subsidies). Both of these programs were able to achieve substantial reductions in the prices of the target products through competitive solicitations. While there is usually much less resistance to programs which make subsidies widely available in a market, the subsidies are expensive and have themselves become the subject of much controversy.

### **5.3 Program Implementation Lessons**

- *Technology improvement brought forth through competitive procurements is not a one-step function ending with the market introduction of the new technology. Further technology improvements can be made during the implementation of the program and this consideration should be designed into the program.*

The best example of this lesson can be found in the DOE Sub-CFL program. DOE made a decision to require independent testing and verification of compliance with program technical specifications for all products sold through the program. But, to avoid a long delay in product introduction, DOE allowed the testing to occur after product sales began, so long as manufacturers submitted certification prior to sales that they met all technical specifications.

During the program's implementation, independent testing arranged by DOE revealed that some models from some suppliers fell short of certain specifications. Depending on the severity and type of deficiencies found, DOE either pulled the deficient product from the market immediately, or asked for quick correction of the deficiency while the product stayed on the market. DOE's philosophy in managing these problems is that it prefers to work with suppliers, helping them improve their technology during the course of the program, as opposed to using product testing as a rigid tool for determining which products can remain in the program. This approach has already helped three program suppliers identify performance deficiencies that were subsequently corrected during program implementation.

- *The higher the retail cost of the target technology, the more expensive and difficult will be the technology procurement program.*

It sounds like common sense, but it still is worth stating: it is far more difficult to persuade buyers to invest in expensive technologies than in low-cost technologies. The costs of developing and implementing technology procurement programs is generally proportional to the cost of the target technology, with expensive technologies requiring larger and more expensive technology procurement programs. Both the clothes washer program and SERP programs were far more difficult and expensive to organize than the sub-CFL program.

- *It is easy to underestimate the size and importance of the promotional/educational part of technology procurement programs.*

All of the programs reviewed in this report suffered from having insufficient funds devoted to the promotion of products and the education of potential buyers of those products. As stated earlier, a previous evaluation of SERP found lack of promotion and consumer education affected the program's success. Both of the DOE programs have faced far more challenging promotional and educational tasks than anticipated during program design.



## 6.0 References

Lee, A. D. and R. L. Conger. 1996. *Super Efficient Refrigerator Program (SERP) Evaluation Volume 2: Preliminary Impact and Market Transformation Assessment*, PNNL-11226, Pacific Northwest National Laboratory, Richland, Washington.

Sandahl, L. J., M. R. Ledbetter, R. I. Chin, K. S. Lewis and J. M. Norling. 1996. *Super Efficient Refrigerator Program (SERP) Evaluation Volume 1: Process Evaluation*, PNNL-10882, Pacific Northwest National Laboratory, Richland, Washington.

Scott, M. J., G.B. Parker, and J.W. Currie 1998. *Using Volume Purchases to Transform Markets for Energy-Efficient Technologies: A Lessons-Learned View from Practitioners*, PNNL-SA-30221, Pacific Northwest National Laboratory, Richland, Washington.

Edgermon, S.D., T.T. Gregg, M.C. Baechler, 1998. *Energy Star® Partnerships Clothes Washer Volume Purchase: Partnering with the city of Austin.* Proceedings of the American Water Works Association 1998 Annual Conference, AWWA, Denver, CO.